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*Full Length Research Paper*

# Dental caries occurrence and associated oral hygiene practices among rural and urban Nigerian pre-school children

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**The objective of this research is to assess the prevalence of dental caries in Nigerian preschool children and establish the proportion of treated lesions and to also investigate the association between oral hygiene habits and dental caries prevalence in the study population. Dental examinations were performed on 404 children aged between 18 months and 5 years and an interview were conducted for the mothers to obtain information about the child and her/his household. The children were recruited from primary health centres where pre-school children are routinely immunized in Lagos State. The prevalence of dental caries in the study population was 10.9%. A significantly higher caries occurrence was observed in children older than 3 years than in those less than 3 years of age ($p < 0.001$). Caries prevalence was not significantly associated with who supervises the child's tooth-brushing ($p = 0.106$), type of toothpaste used ($p = 0.657$) and frequency of tooth brushing ($p = 0.774$). Oral hygiene score was positively correlated with caries prevalence and the relationship was statistically significant ($p < 0.000$). While the prevalence of caries in the study was low, the child's age and oral hygiene score were observed to influence the occurrence of caries in the study population.**

**Key words:** Dental caries, oral hygiene, pre-school children, social class, tooth-brushing.

## INTRODUCTION

Dental caries is a highly prevalent dental disease in children and has been observed in children as young as twelve months of age. The prevalence figures in preschool children range from 18% in Macau (King et al., 2003), 23% in Antigua (Vignarajah and Williams, 1992) to 73% in Saudi Arabia (Al-Malik et al., 2003). There are varying trends in the prevalence of dental caries among preschool children in both developing and developed countries. Reports indicate a decline and more recently, stabilization in the dental caries levels of pre-school children in developed countries (Holm, 1990; Winter, 1990). In developing countries, the trends in dental caries prevalence among preschool children are not clear (Holm, 1990). Even though dental caries is recognized as a major problem in pre-school children, comprehensive information about its occurrence is limited especially in developing countries such as Nigeria due to difficulty in accessing this age-group for data collection.

Several factors including poor dietary and oral hygiene habits as well as social class have been reportedly related to caries occurrence in preschoolers (Gibson and Williams, 1999; Harris et al., 2004; Oliveira et al., 2008; Sayegh et al., 2002; Sowole et al., 2007). It is further reported that those in the lower social classes tend to have higher caries occurrence (Gibson and Williams, 1999; Sayegh et al., 2002). In one study, brushing at least twice daily was associated with reduced caries occurrence although this had less impact in the lower social classes (Gibson and Williams, 1999). In contrast, another study reported that oral hygiene had no association with caries occurrence (King et al., 2003). A study among Nigerian children identified the child's age, gender and frequency of sugar consumption as possible risk factors for developing caries (Folayan et al., 2007). While oral hygiene was identified as a possible predisposing factor for caries occurrence, tooth-brushing

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alone is generally agreed as insufficient for caries prevention and positive results are often attributed to the use of fluoride containing toothpastes (Winter et al., 1990).

Information on caries prevalence among Nigerian pre-school children is limited. Earlier reports indicated lower dental caries prevalence among pre-school children in Nigeria when compared to older Nigerian children (Sowole et al., 2007) and pre-school children in developed countries (Adenubi, 1980; Akpata, 1979; Folayan et al., 2007; Noah, 1984, Sowole et al., 2007). However, most of the earlier studies were conducted in urban areas and although one study included subjects from both rural and urban areas, no comparison was made between the two areas. For Nigeria, because of existing socio-economic and cultural disparities between residents in rural and urban areas, it is important to have comparative studies between the two populations.

This study therefore sought to determine the prevalence of dental caries in pre-school children residing in both urban and rural areas of Lagos State, South-west Nigeria and establish the proportion of treated dental caries in this population. It also tried to examine the association between socio-demographic factors (specifically child's age, gender and social class), oral hygiene methods, frequency of cleaning and the prevalence of caries. The results obtained would contribute to existing information on dental caries experience of Nigerian pre-school children and would be valuable in designing caries prevention programmes for this population.

## MATERIALS AND METHODS

### Population and sampling

A cross-sectional survey of all pre-school children aged 18 to 60 months and their mothers attending primary health centres was conducted in two Local Government Areas (LGA's) of Lagos State Nigeria within a six month period. Children under five years of age routinely receive immunizations against childhood diseases at primary health centres in Nigeria. Sample size calculation was based on a 50% prevalence rate, 5% error and 95% confidence interval. A total of 404 pre-school children were included in the study.

Sampling for the study was done in two stages; two LGAs (one rural and one urban) were selected by simple random method based on the State's classification of LGAs. Two primary health centres in each LGA were then selected by simple random method from a list of primary health centres obtained from the State Ministry of Health. All children between the ages of 18 months and 60 months were enrolled in the study except children whose mothers refused to participate. Consent was sought from the local health authorities and individual consent to participate in the study was sought from the mothers after explaining the nature of the study.

### Questionnaire

Mothers of all participating children were interviewed by a trained interviewer. The questionnaire was designed to obtain information related to their socio-demographic background and oral hygiene habits. The socio-demographic characteristics considered were maternal age, location of residence, child's age, mother's educational level and father's occupation. The social classification used was that described by Olusanya et al. (1995) combining both the mothers' educational status and the fathers' occupations. The children were then grouped into three (3) social classes' namely low, middle and high. The questionnaire assessed the oral hygiene habits of the children, questions asked included the frequency of mouth cleaning, type of toothpaste used, who cleans the child's mouth and how often toothbrushes are replaced.

### Clinical examination

Clinical examination for recording dental caries occurrence was conducted in a well lit area by one of the authors. A plane dental mirror was used to examine the children with the mother and the examiner sitting in a knee-to-knee position. The examiner was trained by an experienced community dentist in using the dft index according to WHO diagnostic criteria (WHO, 1997) and the simplified oral hygiene index (OHI) (Greene and Vermillion, 1964). Teeth were considered carious when there was visual evidence of a carious lesion. Early stages of dental caries were excluded and questionable lesions considered as sound. Frequent occurrence of power outages especially in the rural areas made the use of radiographic examinations for diagnosing dental caries difficult. The oral hygiene score (OHI-S) was assessed using the plaque and debris accumulation on the following index teeth 51, 55, 65, 75, 81 and 85. The debris and calculus scores were then added and divided by the number of surfaces examined to compute the individual's OH score. The training ended with double examination of 20 children. Kappa statistics were used to express intra-examiner reliability yielding a kappa value of 0.8.

### Data analysis

Data entry validation and analysis was done using the SPSS for Windows (version 11.0; SPSS Inc. Chicago. IL statistical software package). The socio-demographic factors examined were recoded as follows before data analysis, location of residence: rural = 1 urban = 2; type of toothpaste used: children's toothpaste = 1 adult toothpaste = 2 and none = 3; who supervises the child's tooth-brushing: child = 1, caregiver = 2; tooth-brushing frequency: varies = 1, once = 2, twice = 3. The chi-squared test was carried out to determine the association between caries prevalence and single variables. Non parametric tests (Mann-Whitney U test and Kruskal Wallis) were used to compare dft values between categories. The Spearman's correlation coefficient was also used to compare dft values and single variables. Associations were considered significant when the p-values were equal or less than 0.05. Logistic regression was then used to determine which of the maternal related social factors and oral hygiene habits could predict caries occurrence in the children.

## RESULTS

A total of 404 children between the ages of 18 and 60 months were examined; 181 (44.8%) in the rural area and 223(55.2%) in the urban area. There were 208 (51.5%) male children and 196 (48.5%) females (Table 1). Observations from this study revealed that various oral hygiene tools were utilised by the children examined such as toothbrush and toothpaste, chewing stick, cotton wool with water and cotton wool with toothpaste (Table 2).

**Table 1.** Soci-demographic characteristics of study population.

| Characteristics | No | Percentage |
|---|---|---|
| **Gender** | | |
| Male | 208 | 51.5 |
| Female | 196 | 48.5 |
| **Age groups** | | |
| <3 years | 144 | 35.6 |
| >3 years | 260 | 64.4 |
| **Location of residence** | | |
| Rural | 181 | 44.8 |
| Urban | 223 | 55.2 |
| **Social class** | | |
| Low | 144 | 35.6 |
| Middle | 132 | 32.7 |
| High | 128 | 31.7 |
| Total | 404 | 100 |

**Table 2.** Method of tooth cleaning.

| Cleaning method | Rural | | Urban | | Total | |
|---|---|---|---|---|---|---|
| | n | (%) | n | (%) | n | (%) |
| Cotton wool and water | 58 | 32.0 | 62 | 27.8 | 120 | 29.7 |
| Cotton wool and toothpaste | 84 | 46.4 | 100 | 44.8 | 184 | 45.5 |
| Chewing stick | 0 | 0.0 | 1 | 0.4 | 1 | 0.2 |
| Toothbrush and paste | 35 | 19.3 | 101 | 45.3 | 136 | 33.7 |
| Glycerine | 7 | 3.9 | 15 | 6.7 | 22 | 5.4 |
| Herbs | 5 | 2.8 | 0 | 0.0 | 5 | 1.2 |
| Others | 28 | 15.4 | 12 | 5.4 | 40 | 9.9 |

*Many mothers reported using more than one method.

Other agents identified include alum, glycerine, tomato, hydrogen peroxide and herbs such as bitter leaf (Verona Amygdalina).

Most mothers (45.3%) in the urban area used tooth-brush and paste while 46.4% in the rural area used cotton wool and paste for cleaning their children's teeth. Overall more children had their teeth cleaned once daily (276 or 68.3%), however slightly more children in the rural area (29.8%) cleaned their teeth twice daily than in the urban area (27.4%). Majority of the children (89.9%) had their mouths cleaned by an adult that is either parent or a caregiver. Family toothpaste was the commonest toothpaste (63.6%) used in this study population, while 32.2% used children's paste and 4.2% reported not using toothpaste. More mothers in the urban area (47.5%) used children's toothpaste while only 13.3% of mothers in the rural area used children's toothpaste. About half of the mothers reported replacing their child's tooth brush every 6 months, 31.4% replace only when worn down while the other mothers did not recollect how often they changed their children's toothbrushes.

Overall, 44 (10.9%) of the children examined had dental caries. On the severity of caries, almost half of the children with caries 19 (43.2%) had 1 carious lesion; however 10 (22.7%) children had more than 3 carious lesions. None of the children examined had received any dental treatment. The pattern of caries occurrence in the study population revealed that the mandibular second molar had the highest caries prevalence (3.5%) followed by the mandibular first molar (3.1%) and then the maxillary first molar (1.4%). The mandibular lateral incisor and canine were unaffected by dental caries (Table 3). Table 4 shows no statistically significant difference between the caries prevalence and dft index in the rural and urban areas ($p = 0.089$) although the prevalence and mean dft score was slightly higher in the rural area.

**Table 3.** Tooth specific caries prevalence in Nigerian preschool children.

| Tooth type | Maxillary | | | Mandibular | | |
|---|---|---|---|---|---|---|
| | Right (%) | Left (%) | Total (%) | Right (%) | Left (%) | Total (%) |
| Central incisor | 2.0 | 2.7 | 2.3 | 0.2 | 0.2 | 0.2 |
| Lateral incisor | 1.0 | 0.9 | 0.9 | 0.0 | 0.0 | 0.0 |
| Canine | 0.0 | 0.2 | 0.1 | 0.0 | 0.0 | 0.0 |
| First molar | 1.5 | 1.2 | 1.4 | 2.7 | 3.5 | 3.1 |
| Second molar | 0.5 | 1.2 | 0.9 | 3.7 | 3.2 | 3.5 |

**Table 4.** Caries prevalence by location, gender and age category.

| | Gender | | Residence | | Childs age category | |
|---|---|---|---|---|---|---|
| | Male | Female | Rural | Urban | < 3years | > 3years |
| No of children caries free | 188 | 172 | 156 | 204 | 139 | 221 |
| Percentage caries free | 90.4 | 87.8 | 86.2 | 91.5 | 96.5 | 85.0 |
| No of children affected by caries | 20 | 24 | 25 | 19 | 5 | 39 |
| Percentage affected by caries | 9.6 | 12.2 | 13.8 | 8.5 | 3.5 | 15.0 |
| Total % | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| p-value | 0.396490 | | p = 0.089519 | | 0.000 * | |

* Significant.

Social class (p = 0.728) and gender (p = 0.396) also had no effect on caries occurrence. There was however a significantly higher caries occurrence in children older than 3 years than in those less than 3 years of age (p = 0.000). Caries prevalence was not significantly associated with who supervises the child's tooth-brushing (p = 0.106), type of toothpaste used (p = 0.657) and frequency of tooth brushing (p = 0.774) Table 5.

The oral hygiene status (OHI-S ) in the urban local government area was found to be better than in the rural area with mean OHI-S of 1.20 and 1.40, respectively, although, the difference was not statistically significant (p > 0.05). The mean OHI-S was 1.21 for females and 1.36 for males, this difference was statistically significant (p < 0.05). The OHI-S was observed to rise with increasing age. Children less than 3 years had a mean score of 1.26 while those more than 3 years had a mean score of 1.38. The difference in the level of oral hygiene between the age categories however was not significant (p > 0.05).

Mean dft level in those less than 3 years of age was 0.069 ± 0.42 and 0.35 ± 1.07 in those older than 3 years (Table 6). The dft level was observed to be significantly correlated with both the child's age and the oral hygiene score (p < 0.005). An increase in the child age was associated with an increased caries occurrence while a decrease in the child's age was associated with lower caries levels (Table 7). Multivariate regression analysis showed that for every unit increase in the oral hygiene score the child's odds for developing caries increased by 64% (p < 0.000) (Table 8).

## DISCUSSION

The results of earlier studies indicated that the prevalence of dental caries among Nigerian children is relatively lower than what is obtained in the developed countries (Cleaton-Jones et al., 1979; Grytten et al., 1988; Folayan et al., 2007; Harris et al., 2004; Sowole et al., 2007). The present study confirmed the same to be true among the children examined. However, the results is lower than what was obtained in studies conducted in the country in the 70's and 80's (Adenubi, 1980; Akpata, 1979; Noah, 1984) but similar to that of a recent study conducted in both rural and urban communities (Sowole et al., 2007). This might suggest that there has been a reduction in caries occurrence among Nigerian pre-school children.

Despite the low dental caries experience among these children, the low treatment ratio makes dental caries a disease of public health concern. None of the children examined in this survey had received any form of dental treatment suggesting either low utilization due to lack of perception of the need for dental care for the children on the part of the parents or poor access to oral health services in this population. The reason for this pattern is unclear and further research to identify utilization barriers in this population is suggested. Nevertheless, it may be necessary to institute an oral health programme focused on providing dental care for pre-school children in Lagos State, Nigeria.

Only the child's age was found to influence the develop-

**Table 5.** Caries prevalence and oral hygiene habits.

| | Caries present (%) | Caries absent (%) | P-value |
|---|---|---|---|
| **Who supervises cleaning?** | | | |
| Adult | 36 (9.9) | 327 (90.1) | 0.106 |
| Child | 8 (19.5) | 33 (80.5) | |
| **Type of toothpaste used** | | | |
| Children's | 14 (10.8) | 116 (89.2) | |
| Adult | 27 (10.5) | 230 (89.5) | 0.657 |
| None | 31 (11.2) | 245 (88.8) | |
| **Frequency of tooth brushing** | | | |
| Once | 31 (11.2) | 245 (88.8) | |
| Twice | 11 (9.6) | 104 (90.4) | 0.774 |
| Varies | 2 (15.4) | 11 (84.6) | |

**Table 6.** Mean dft scores by location gender and age category.

| | Gender | | Residence | | Age Category | |
|---|---|---|---|---|---|---|
| | **Male** | **Female** | **Rural** | **Urban** | **< 3 years** | **> 3 years** |
| Mean dft | 0.24 | 0.26 | 0.32 | 0.19 | 0.069 | 0.35 |
| Standard deviation | 0.98 | 0.82 | 1.07 | 0.74 | 0.42 | 1.07 |
| p-value | p = 0.3954 | | p = 0.1443 | | p = 0.004* | |

* Significant.

**Table 7.** Correlation between dft levels, social characteristics, oral hygiene habits.

| | dft level | |
|---|---|---|
| | **Spearman's correlation coefficient** | **p-value** |
| Social class | 0.019 | 0.703 |
| Location of residence | -0.083 | 0.095 |
| Childs age | -0.153 | 0.002* |
| Childs gender | -0.042 | 0.396 |
| Type of toothpaste used | -0.021 | 0.678 |
| Frequency of toothbrush replacement | -0.028 | 0.578 |
| Who cleans the teeth | -0.096 | 0.053 |
| Frequency of tooth brushing | -0.031 | 0.541 |
| Oral hygiene score | 0.232 | 0.000* |

*$p < 0.05$.

ment of caries in this study unlike another study (Sowole et al., 2007) where both age and gender were found to be associated with caries development in Nigerian children. The latter study however included both pre-school and school aged children and this may account for the difference in results. Urbanisation has been associated with higher caries occurrence in children as urban dwellers consume more refined carbohydrates than their rural counterparts (Cleaton-Jones et al., 1979). This study however showed no statistically significant difference in caries occurrence between children in the rural and urban areas although slightly more children in the rural area had carious lesions. A similar trend was also reported in Antiguan pre-school children (Vignarajah and Williams, 1992). This result is in consonance with another Nigerian study (Sofola et al., 2004) comparing dental caries occurrence in urban and rural children which found no statistically significant difference in the dft scores of 4 - 6 years old but reported significant differences in the older age groups. This suggests the probability that the risk

**Table 8.** Multiple logistic regression model of caries risk in relation to socio-demographic variables and oral hygiene habits.

| Variable | Coefficient | F test | p-value |
|---|---|---|---|
| Childs age | 0.077 | 2.620 | 0.106 |
| Childs sex | 0.050 | 0.274 | 0.601 |
| Social class | 0.062 | 0.857 | 0.355 |
| Location of residence | -0.065 | 0.370 | 0.544 |
| Frequency of tooth cleaning | 0.040 | 0.164 | 0.685 |
| Who cleans | 0.221 | 1.853 | 0.174 |
| Type of toothpaste used | -0.001 | 0.000 | 0.990 |
| Oral hygiene score | 0.366 | 22.952 | 0.000* |

$r^2$ = 0.009 F statistic = 4.306. * Significant.

factors for caries are modified as the child grows.

In agreement with some earlier studies (Cleaton-Jones et al., 1979; Grytten et al., 1988; King et al., 2003) oral hygiene methods, frequency of cleaning and who supervises the cleaning process were not found to be significantly related to caries occurrence in this study. This result is at variance with another survey where frequency of tooth brushing was observed to affect caries prevalence (Gibson and Williams, 1999). This may be explained by the fact that oral hygiene habits were observed to be similar in both rural and urban locations. However, the OHI score was significantly correlated with the occurrence of caries in the study respondents. This agrees with a recent Nigerian study which reported that poor oral hygiene was a risk factor for developing dental caries (Folayan et al., 2007).

Therefore, one way of preventing dental caries among Nigerian pre-school children may the institution of good oral hygiene practices in this population. This may be achieved by teaching mothers and caregivers effective toothbrushing methods via oral health education programmes in places such as the immunization clinics where this study was carried out. Oral health promotion strategies aimed at increasing access to affordable tooth brushes and fluoride-containing dentrifices would also help in preventing caries. However, there are limitations in relating oral hygiene scores to caries occurrence because oral hygiene score is a point in time measure while dental caries is a progressive condition. Furthermore, results from cross-sectional studies are not valid for drawing conclusions concerning causality. Therefore, a longitudinal study to determine whether oral hygiene is truly a risk factor for caries development in Nigerian pre-school children is suggested.

In conclusion, the prevalence of dental caries among pre-school children in Lagos State is quite low and the treatment ratio is non-existent. Poor oral hygiene levels significantly increased the children's risk of developing caries.

**REFERENCES**


Adenubi JO (1980). Dental health status of 4 and 5 year old children in Lagos private schools. Niger. Dent. J. 1: 28-39

Akpata ES (1979). The prevalence and distribution of dental caries and gingivitis in the primary dentitions of 6-year old Lagos children. J. Int. Ass. Dent. Child 10: 3- 9.

Al-Malik MI, Holt RD, Bedi R (2003). Prevalence and patterns of caries, rampant caries, and oral health in two to five year old children in Saudi Arabia. J. Dent. Child (Chic) 70(3): 235-242.

Cleaton-Jones P, Richardson BD, Rantsho JM, Pieters L, McInnes PM (1979). Patterns of oral hygiene and dental caries in urban and rural South African Preschool children. Odont. Stom Trop II (8): 27-33.

Folayan M, Sowole A, Kola-Jebutu A (2007). Risk factors for caries in children from South-Western Nigeria. J. Clin. Pediatr. Dent. 32(2): 173-178

Gibson S, Williams S (1999). Dental caries in preschool children: Associations with social class, toothbrushing habit and consumption of sugars and sugar containing foods. Caries Res. 33: 101-113.

Greene JC, Vermillion JR (1964). The simplified oral hygiene index. J. Am. Dent. Assoc. 68: 7-13.

Grytten J, Rosslow I, Holst D, Steele L (1988). Longitudinal study of dental health behaviours and other caries predictors in early childhood. Community Dent. Oral Epidemiol 16: 356-359.

Harris R, Nicolli AD, Adair PM, Pine CM (2004). Risk factors for dental caries in young children: a systematic review of the literature. Community Dental Health SCD 21 (Suppl): 71–85.

Holm AK (1990). Caries in the preschool child: International trends. J. Dent.18: 21-25.

King NM, Wu II, Tsai JS (2003). Caries prevalence and distribution, and oral health habits of zero to four year old children in Macau, China. J. Dent. Child (Chic) 70(3): 243-249.

Noah MO (1984). The prevalence and distribution of dental caries and gingivitis in 6 year old children attending free government schools in Ibadan, Nigeria. Odont. Stom. Trop 3: 119 – 127.

Oliveira LB, Sheiham A, Bonecker M (2008). Exploring the association of dental caries with social factors and nutritional status in Brazilian preschool children. Eur. J. Oral Sci. 116(1): 37-43.

Olusanya O, Okpere E, Ezimokhai M (1995). The importance of social class in voluntary fertility control in a developing country. W. Afr. J. Med. 4(4): 205-212.

Sayegh A, Dini EL, Holt RD, Bedi R (2002). Food and drink consumption, sociodemographic factors and dental caries in 4-5 year old children in Amman, Jordan. Int. Dent J. 52: 87- 93.

Sofola OO, Jeboda SO, Shaba OP (2004). Dental caries status of primary school children aged 4 -16 years in Southwest Nigeria. Odont Stom Trop. 108: 19-22.

Sowole A, Sote E, Folayan M (2007). Dental caries pattern and predis - posing oral hygiene related factors in Nigerian preschool children.

Eur. Arch. Paediatr. Dent. 8(4): 206-210.

Vignarajah S, Williams GA (1992). Prevalence of dental caries and enamel defects in the primary dentition of Antiguan preschool children aged 3-4 years including an assessment of their habits. Community Dental Health. 9:349-360.

Winter GB (1990). Caries in the preschool child. J. Dent. 18: 325-326.

World Health Organization (1997). Oral Health Survey: Basic Methods. 4th ed. Geneva. WHO.